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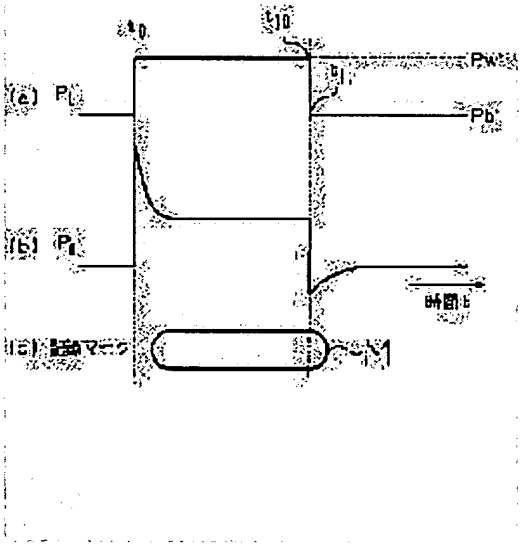
(54) METHOD FOR RECORDING OPTICAL INFORMATION AND DEVICE THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To detect the form state of a record mark during recording, and to perform recording, controlling to rectify a drift of an optimal recording power caused by the fluctuations of a power of a light source, variations in a tilt, sensitivity of a recording medium, etc., without depending on the characteristics, etc., of the recording medium.

SOLUTION: This device detects the form state of a record mark M during recording by detecting a change in a received photo signal Pd in a certain predetermined section from t11, immediately after having controlled an output power of a light source to a bottom power Pb' by which the record mark M is not formed. Even if the drift of an optimum record power is caused by the variations in the output of the light source, a tilt of a recording medium, etc., it is possible to perform recording by always controlling the output power of the light source to an optimum recording power in that state according to a detection result.



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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] While modulating the light source according to predetermined information by the light source control means, the output power is controlled. In the optical information record approach which recorded information according to whether the record mark from which the output light from said light source is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed Receive the reflected light from said record medium with a light-receiving means, and it changes into a light-receiving signal. Change of the light-receiving signal of said light-receiving means within a certain predetermined section or a light-receiving signal is detected from from immediately after controlling the output power of said light source to the bottom product power in which a record mark is not formed. The optical information record approach characterized by controlling the output power of said light source by said light source control means according to this detection result.
[Claim 2] While modulating the light source according to predetermined information by the light source control means, the output power is controlled. In the optical information record approach which recorded information according to whether the record mark from which the output light from said light source is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed Receive the reflected light from said record medium with a light-receiving means, and it changes into a light-receiving signal. The optical information record approach characterized by detecting the light-receiving signal of said light-receiving means in near immediately after immediately after controlling the output power of said light source to the bottom product power in which a record mark is not formed, and controlling the output power of said light source by said light source control means according to this detection result.
[Claim 3] While modulating the light source according to predetermined information by the light source control means, the output power is controlled. In the optical information record approach which recorded information according to whether the record mark from which the output light from said light source is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed Receive the reflected light from said record medium with a light-receiving means, and it changes into a light-receiving signal. Time amount until the light-receiving signal of said light-receiving means becomes a predetermined value from the time of day which controlled the output power of said light source to the bottom product power in which a record mark is not formed is detected. The optical information record approach characterized by controlling the output power of said light source by said light source control means according to this detection result.
[Claim 4] While modulating the light source according to predetermined information by the light source control means, the output power is controlled. In the optical information record approach which recorded information according to whether the record mark from which the output light from said light source is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed While detecting the light-receiving signal of said light-receiving means in near immediately after immediately after receiving the reflected light from said record medium with a light-receiving means, changing into a light-receiving signal, and controlling the output power of said light

source to the bottom product power in which a record mark is not formed The optical information record approach characterized by detecting time amount until the light-receiving signal of said light-receiving means becomes a predetermined value from the time of day which controlled the output power of said light source to bottom product power, and controlling the output power of said light source by said light source control means according to these detection results.

[Claim 5] In case trial writing is beforehand performed to the predetermined field of said record medium, changing the record power of said light source Match with record power, hold the detection output, and the value corresponding to the power is computed as a control-objectives value with calculation of the optimal record power. Claim 1 characterized by controlling the output power of said light source by said light source control means so that a detection output serves as said control-objectives value thru/or the optical information record approach given in any 1 of 4.

[Claim 6] While carrying out monitor light-receiving of a part of output light of said light source and sampling a monitor output at the time of the bottom product power output of said light source, said sampled monitor output is held at the time of the record power output of said light source. Claim 1 characterized by controlling the bottom product power of said light source according to said held monitor output at the time of the bottom product power output of said light source, and making it control by said light source control means at the time of the record power output of said light source thru/or the optical information record approach given in any 1 of 4.

[Claim 7] Claim 1 characterized by the modulation approach of said light source by said light source control means being the multi-pulse record approach which forms one record mark by two or more pulse trains thru/or the optical information record approach given in any 1 of 6.

[Claim 8] Said record medium is claim 1 characterized by having the record layer which consists of a record ingredient in which a record mark is formed by heat mode thru/or the optical information record approach given in any 1 of 7.

[Claim 9] In the optical information recording device which records information according to whether the record mark from which the output light from the light source modulated according to predetermined information is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed A light-receiving means to receive the reflected light from said record medium, and to change into a light-receiving signal, A detection means to detect change of the light-receiving signal of said light-receiving means within a certain predetermined section, or a light-receiving signal from from immediately after controlling the output power of said light source to the bottom product power in which a record mark is not formed, The optical information recording device characterized by having the light source control means which controls the output power of said light source according to the detection result of said detection means while modulating said light source according to predetermined information.

[Claim 10] In the optical information recording device which records information according to whether the record mark from which the output light from the light source modulated according to predetermined information is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed A light-receiving means to receive the reflected light from said record medium, and to change into a light-receiving signal, A detection means to detect the light-receiving signal of said light-receiving means in near immediately after immediately after controlling the output power of said light source to the bottom product power in which a record mark is not formed, The optical information recording device characterized by having the light source control means which controls the output power of said light source according to the detection result of said detection means while modulating said light source according to predetermined information.

[Claim 11] In the optical information recording device which records information according to whether the record mark from which the output light from the light source modulated according to predetermined information is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed A light-receiving means to receive the reflected light from said record medium, and to change into a light-receiving signal, A detection means to detect time amount until the light-receiving signal of said light-receiving means becomes a predetermined value from the time of day

which controlled the output power of said light source to the bottom product power in which a record mark is not formed, The optical information recording device characterized by having the light source control means which controls the output power of said light source according to the detection result of said detection means while modulating said light source according to predetermined information.
[Claim 12] In the optical information recording device which records information according to whether the record mark from which the output light from the light source modulated according to predetermined information is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed A light-receiving means to receive the reflected light from said record medium, and to change into a light-receiving signal, The 1st detection means which detects the light-receiving signal of said light-receiving means in near immediately after immediately after controlling the output power of said light source to the bottom product power in which a record mark is not formed, The 2nd detection means which carries out time amount until the light-receiving signal of said light-receiving means becomes a predetermined value from the time of day which controlled the output power of said light source to bottom product power, The optical information recording device characterized by having the light source control means which controls the output power of said light source according to the detection result of said 1st and 2nd detection means while modulating said light source according to predetermined information.
[Claim 13] The light-receiving means for monitors which carries out monitor light-receiving of a part of output light of said light source, and the sample hold circuit which holds said monitor output which sampled the monitor output of said light-receiving means for monitors at the time of the bottom product power output of said light source, and was sampled at the time of the record power output of said light source, It has the APC circuit which controls the bottom product power of said light source according to the output of this sample hold circuit. At the time of the bottom product power output of said light source, the bottom product power of said light source is controlled by said APC circuit according to said monitor output. Claim 9 characterized by making it control by said light source control means at the time of the record power output of said light source thru/or an optical information recording device given in any 1 of 12.
[Claim 14] A detection means is an optical information recording device according to claim 10 characterized by having a bottom product hold means to detect and hold the bottom product value of the light-receiving signal by the light-receiving means, and a sampling means to incorporate the output value of this bottom product hold means to predetermined timing.
[Claim 15] A bottom product hold means for a detection means to detect the bottom product value of the light-receiving signal by the light-receiving means, and to hold, The 1st sampling means which incorporates the output value of this bottom product hold means to the 1st predetermined timing, The 2nd sampling means which incorporates the output value of said bottom product hold means to the 2nd predetermined timing, The optical information recording device according to claim 10 characterized by having a normalization means to normalize the output of said 1st sampling means with the output of said 2nd sampling means, and to output to said light source control means.
[Claim 16] A detection means is an optical information recording device according to claim 11 characterized by having the comparator which compares the light-receiving signal by the light-receiving means with a predetermined reference signal, and a pulse width detection means to detect the pulse width of the output of this comparator.
[Claim 17] The comparator with which a detection means compares the light-receiving signal by the light-receiving means, and a predetermined reference signal, A pulse width detection means to detect the pulse width of the output of this comparator, and a sampling means to incorporate the light-receiving signal by said light-receiving means to predetermined timing, The optical information recording device according to claim 11 characterized by having the reference signal modification means made into the signal value reduced at a fixed rate from the output value or this output value of said sampling means as said predetermined reference signal.
[Claim 18] Said record medium is claim 9 characterized by having the record layer which consists of a record ingredient in which a record mark is formed by heat mode thru/or an optical information

recording device given in any 1 of 17.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical information record approach and its equipment.
[0002]
[Description of the Prior Art] The optical information recording device in which record like recent-years (Compact Disk-Recordable), for example, CD-R, drive equipment is possible is put in practical use, and the research which aimed at large-capacity-izing and high-speed record-ization further is made. The rewritable disk using a write once optical disk, a recordable magneto-optical media, and recordable phase change mold media using pigment system media as an optical disk medium etc. is mentioned.
[0003] With a common optical disk recording device, a record mark is formed by irradiating the laser beam from the semiconductor laser in which made semiconductor laser the light source and pulse modulation was carried out by recording information at a record medium. Since the configuration condition of a record mark changes with the power of the laser beam to record at this time, in the former In order to ask for the record power suitable for the property of a record medium, trial writing is performed changing record power to a predetermined field beforehand as preparation of a recording start. The so-called OPC (Optimum Power Control) method the symmetric property (Asymmetry) of a regenerative signal makes power which recorded the best area the optimal record power, and asks for it all over the field is used after trial writing. It records maintaining the optimal record power for which carried out in this way at the time of record of actual data, and it asked.
[0004] However, even if he is trying to record data, obtaining the optimal record power and maintaining the optimal record power by trial writing even if The power irradiated by the record medium by the temperature change of the radiant power output of semiconductor laser etc. differs from the optimal record power, or it sprinkles within the field of a record medium the degree of admiration. There is a problem always recording that it is as differing in a data storage area **** by the optimal record power or that record power which becomes the optimal is not made with the inclination of the disk to the laser radiation light called a tilt etc.
[0005] There is JP,57-60696,B etc. as an example of a proposal for solving this problem. When recording data on an optical disk, he detects change of the reflected light under record, and is trying to control the output of the light source by this example of an official report based on the detecting signal. According to this, since it can obtain while recording the formation condition of a record mark, it is recordable, controlling to amend a gap of the optimal record power by power fluctuation and the tilt of the semiconductor laser of a under [record], dispersion of media sensibility, etc. In case the same trial writing as the above is performed, it matches with the record power which wrote in the detecting signal which shows change of the above-mentioned amount of reflected lights, holds, and tries and writes, and a regenerative signal is more specifically made into a control-objectives value the back, and the record power of semiconductor laser is controlled serially. the same technique as this -- R-OPC (Running-Optimum Power Control) -- it is put in practical use by CD-R drive equipment as a control system.

[0006]
[Problem(s) to be Solved by the Invention] However, it is greatly dependent on record conditions, such as record linear velocity, and the record sensibility property of a record medium, and formation of a record mark has the following problems depending on record conditions or a record medium.
[0007] That is, it is the problem that a changed part of exposure power is dominant and changed detection of the amount of reflected lights by record mark formation is difficult in order for change of the amount of reflected lights from the record medium by record mark formation to hardly appear or for the exposure quantity of light and the reflection factor of the field to determine the amount of reflected lights during a record power exposure. even if this problem is not only the difference in a record medium but the same medium -- the difference in record linear velocity -- (-- this is change and homonymy) of a record sensibility property, and the problem which may arise. It becomes remarkable, so that it becomes high record linear velocity especially.
[0008] Moreover, there is not a single square wave but the so-called multi-pulse record approach of forming one record mark by two or more pulses, about a record wave, and it is the record approach suitable for mass record, and is used abundantly. however, since each pulse width is short and the luminescence condition of semiconductor laser changes for a short time, it is difficult in the amount of reflected lights decreasing rapidly by the cutoff pulse, before obtaining change of the amount of reflected lights boiled and depended on record power, and change to which the amount of reflected lights increases rapidly by the heating pulse coming to be shown again, and detecting change of the amount of reflected lights from the record medium by record mark formation during a record power exposure
[0009] Then, this invention can detect the configuration condition of a record mark in record, and aims at offering the optical information record approach recordable while controlling to amend a gap of the optimal record power by power fluctuation and the tilt of the light source, sensibility dispersion of a record medium, etc., and its equipment, without being dependent on the property of a record medium, record linear velocity, the record approach, etc.
[0010]
[Means for Solving the Problem] Invention according to claim 1 controls the output power while modulating the light source according to predetermined information by the light source control means. In the optical information record approach which recorded information according to whether the record mark from which the output light from said light source is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed Receive the reflected light from said record medium with a light-receiving means, and it changes into a light-receiving signal. Change of the light-receiving signal of said light-receiving means within a certain predetermined section or a light-receiving signal is detected from from immediately after controlling the output power of said light source to the bottom product power in which a record mark is not formed, and the output power of said light source was controlled by said light source control means according to this detection result.
[0011] By therefore, the thing for which change of the light-receiving signal within a certain predetermined section or a light-receiving signal is detected from from immediately after controlling the output power of the light source to the bottom product power in which a record mark is not formed By being able to detect the formation condition of a record mark and controlling the output power of the light source according to this detection result during record It is recordable, always controlling to the optimal record power in the condition, even if fluctuation of the optimal record power by a tilt, sensibility dispersion, etc. of output fluctuation of the light source or a record medium arises. Furthermore, or change of the amount of reflected lights from the record medium by record mark formation hardly appears during a record power exposure, it is buried in the variable component of record power, and it is recordable, controlling to the optimal record power, even if the detection is a difficult record medium and record conditions.
[0012] Invention according to claim 2 controls the output power while modulating the light source according to predetermined information by the light source control means. In the optical information record approach which recorded information according to whether the record mark from which the

output light from said light source is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed Receive the reflected light from said record medium with a light-receiving means, and it changes into a light-receiving signal. The light-receiving signal of said light-receiving means in near immediately after is detected immediately after controlling the output power of said light source to the bottom product power in which a record mark is not formed, and the output power of said light source was controlled by said light source control means according to this detection result.

[0013] Therefore, the light-receiving signal in near immediately after is detected immediately after controlling the output light of the light source to bottom product power, and a technical problem can be solved for the formation condition of a record mark like [can detect to accuracy and] the case where it is invention according to claim 1, simple by controlling the output power of the light source according to this detection result.

[0014] Invention according to claim 3 controls the output power while modulating the light source according to predetermined information by the light source control means. In the optical information record approach which recorded information according to whether the record mark from which the output light from said light source is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed Receive the reflected light from said record medium with a light-receiving means, and it changes into a light-receiving signal. Time amount until the light-receiving signal of said light-receiving means becomes a predetermined value from the time of day which controlled the output power of said light source to the bottom product power in which a record mark is not formed is detected, and the output power of said light source was controlled by said light source control means according to this detection result.

[0015] Therefore, time amount until a light-receiving signal becomes a predetermined value from the time of day which controlled the output power of the light source to bottom product power is detected, and a technical problem can be solved like the case of invention according to claim 1 by controlling the output power of the light source according to this detection result. Moreover, even if it is a case with it difficult [to carry out change with the steep optical output of the light source, therefore to detect a light-receiving signal to a high speed and accuracy], easy and the formation condition of the record mark to accuracy are detectable.

[0016] Invention according to claim 4 controls the output power while modulating the light source according to predetermined information by the light source control means. In the optical information record approach which recorded information according to whether the record mark from which the output light from said light source is irradiated at a record medium, and a reflection factor changes with the strength of the exposure light is formed While detecting the light-receiving signal of said light-receiving means in near immediately after immediately after receiving the reflected light from said record medium with a light-receiving means, changing into a light-receiving signal, and controlling the output power of said light source to the bottom product power in which a record mark is not formed Time amount until the light-receiving signal of said light-receiving means becomes a predetermined value from the time of day which controlled the output power of said light source to bottom product power is detected, and the output power of said light source was controlled by said light source control means according to these detection results.

[0017] Therefore, while detecting the light-receiving signal in near immediately after immediately after controlling the output power of the light source to bottom product power, time amount until a light-receiving signal becomes a predetermined value from the time of day controlled to bottom product power is detected, and a technical problem can be solved with a more sufficient precision like the case of invention according to claim 1 by controlling the output power of the light source according to these detection results.

[0018] Invention according to claim 5 is set to claim 1 thru/or the optical information record approach given in any 1 of 4. In case trial writing is beforehand performed to the predetermined field of said record medium, changing the record power of said light source It matches with record power, the detection output is held, the value corresponding to the power is computed as a control-objectives value

with calculation of the optimal record power, and the output power of said light source was controlled by said light source control means so that a detection output served as said control-objectives value. Therefore, when realizing claim 1 thru/or the optical information record approach given in any 1 of 4, the output power of the light source is easily controllable.
[0019] Invention according to claim 6 is set to claim 1 thru/or the optical information record approach given in any 1 of 4. While carrying out monitor light-receiving of a part of output light of said light source and sampling a monitor output at the time of the bottom product power output of said light source, said sampled monitor output is held at the time of the record power output of said light source. At the time of the bottom product power output of said light source, the bottom product power of said light source is controlled according to said held monitor output, and it was made to control by said light source control means at the time of the record power output of said light source. Therefore, at the time of detection of the formation condition of a record mark, since the output power of the light source is not changed, it becomes controllable [exact detection i.e., exact record power,].
[0020] Invention according to claim 7 is the multi-pulse record approach that the modulation approach of said light source by said light source control means forms one record mark by two or more pulse trains, in claim 1 thru/or the optical information record approach given in any 1 of 6. Therefore, also in the case of mass recording methods, such as DVD, it is applicable convenient.
[0021] Invention according to claim 8 has the record layer which said record medium becomes from the record ingredient in which a record mark is formed by heat mode in claim 1 thru/or the optical information record approach given in any 1 of 7. Therefore, the sensibility of change of the amount of reflected lights is dramatically high, and since it is the record medium which can form a record mark immediately after an exposure, it is applicable suitable for claim 1 thru/or the optical information record approach given in any 1 of 7.
[0022] In the optical information recording device which records information according to whether the record mark from which invention according to claim 9 irradiates the output light from the light source modulated according to predetermined information at a record medium, and a reflection factor changes with the strength of the exposure light is formed A light-receiving means to receive the reflected light from said record medium, and to change into a light-receiving signal, A detection means to detect change of the light-receiving signal of said light-receiving means within a certain predetermined section, or a light-receiving signal from from immediately after controlling the output power of said light source to the bottom product power in which a record mark is not formed, While modulating said light source according to predetermined information, it had the light source control means which controls the output power of said light source according to the detection result of said detection means.
[0023] By therefore, the thing for which a detection means to detect change of the light-receiving signal within a certain predetermined section or a light-receiving signal from from is established immediately after controlling the output power of the light source to the bottom product power in which a record mark is not formed By establishing during record the light source control means which can detect the formation condition of a record mark and controls the output power of the light source according to this detection result It is recordable, always controlling to the optimal record power in the condition, even if fluctuation of the optimal record power by a tilt, sensibility dispersion, etc. of output fluctuation of the light source or a record medium arises. Furthermore, or change of the amount of reflected lights from the record medium by record mark formation hardly appears during a record power exposure, it is buried in the variable component of record power, and it is recordable, controlling to the optimal record power, even if the detection is a difficult record medium and record conditions.
[0024] In the optical information recording device which records information according to whether the record mark from which invention according to claim 10 irradiates the output light from the light source modulated according to predetermined information at a record medium, and a reflection factor changes with the strength of the exposure light is formed A light-receiving means to receive the reflected light from said record medium, and to change into a light-receiving signal, A detection means to detect the light-receiving signal of said light-receiving means in near immediately after immediately after controlling the output power of said light source to the bottom product power in which a record mark is

not formed, While modulating said light source according to predetermined information, it had the light source control means which controls the output power of said light source according to the detection result of said detection means.
[0025] Therefore, a technical problem is [the formation condition of a record mark] solvable like [can detect to accuracy and] the case where it is invention according to claim 9, simple by establishing a detection means to detect the light-receiving signal in near immediately after, immediately after controlling the output light of the light source to bottom product power, and establishing the light source control means which controls the output power of the light source according to this detection result.
[0026] In the optical information recording device which records information according to whether the record mark from which invention according to claim 11 irradiates the output light from the light source modulated according to predetermined information at a record medium, and a reflection factor changes with the strength of the exposure light is formed A light-receiving means to receive the reflected light from said record medium, and to change into a light-receiving signal, A detection means to detect time amount until the light-receiving signal of said light-receiving means becomes a predetermined value from the time of day which controlled the output power of said light source to the bottom product power in which a record mark is not formed, While modulating said light source according to predetermined information, it had the light source control means which controls the output power of said light source according to the detection result of said detection means.
[0027] Therefore, a technical problem is solvable like the case of invention according to claim 9 by establishing a detection means to detect time amount until a light-receiving signal becomes a predetermined value from the time of day which controlled the output power of the light source to bottom product power, and establishing the light source control means which controls the output power of the light source according to this detection result. Moreover, even if it is a case with it difficult [to carry out change with the steep optical output of the light source, therefore to detect a light-receiving signal to a high speed and accuracy], easy and the formation condition of the record mark to accuracy are detectable with a detection means.
[0028] In the optical information recording device which records information according to whether the record mark from which invention according to claim 12 irradiates the output light from the light source modulated according to predetermined information at a record medium, and a reflection factor changes with the strength of the exposure light is formed A light-receiving means to receive the reflected light from said record medium, and to change into a light-receiving signal, The 1st detection means which detects the light-receiving signal of said light-receiving means in near immediately after immediately after controlling the output power of said light source to the bottom product power in which a record mark is not formed, The 2nd detection means which carries out time amount until the light-receiving signal of said light-receiving means becomes a predetermined value from the time of day which controlled the output power of said light source to bottom product power, While modulating said light source according to predetermined information, it had the light source control means which controls the output power of said light source according to the detection result of said 1st and 2nd detection means.
[0029] Therefore, the 1st detection means which detects the light-receiving signal in near immediately after immediately after controlling the output power of the light source to bottom product power, By establishing the 2nd detection means which detects time amount until a light-receiving signal becomes a predetermined value from the time of day controlled to bottom product power, and establishing the light source control means which controls the output power of the light source according to these detection results A technical problem can be solved with a more sufficient precision like the case of invention according to claim 9.
[0030] Invention according to claim 13 is set to claim 9 thru/or an optical information recording device given in any 1 of 12. The light-receiving means for monitors which carries out monitor light-receiving of a part of output light of said light source, and the sample hold circuit which holds said monitor output which sampled the monitor output of said light-receiving means for monitors at the time of the bottom product power output of said light source, and was sampled at the time of the record power output of said light source, It has the APC circuit which controls the bottom product power of said light source

according to the output of this sample hold circuit. At the time of the bottom product power output of said light source, the bottom product power of said light source is controlled by said APC circuit according to said monitor output, and it was made to control by said light source control means at the time of the record power output of said light source. Therefore, when realizing claim 9 thru/or an optical information recording device given in any 1 of 12, the output power of the light source is easily controllable by the APC circuit and the light source control means.

[0031] Invention according to claim 14 has a bottom product hold means for a detection means to detect the bottom product value of the light-receiving signal by the light-receiving means, and to hold, and a sampling means to incorporate the output value of this bottom product hold means to predetermined timing, in an optical information recording apparatus according to claim 10. Therefore, an optical information recording device according to claim 10 is realizable with the configuration of a simple detection means.

[0032] Invention according to claim 15 is set to an optical information recording device according to claim 10. A detection means A bottom product hold means to detect and hold the bottom product value of the light-receiving signal by the light-receiving means, The 1st sampling means which incorporates the output value of this bottom product hold means to the 1st predetermined timing, It has the 2nd sampling means which incorporates the output value of said bottom product hold means to the 2nd predetermined timing, and a normalization means to normalize the output of said 1st sampling means with the output of said 2nd sampling means, and to output to said light source control means. Therefore, even if it changes the quantity of light of bottom product power, and the reflection factor in the tooth space of a record medium, it can control without error, and an optical information recording device according to claim 10 can be realized more to high degree of accuracy.

[0033] Invention according to claim 16 has the comparator with which a detection means compares the light-receiving signal by the light-receiving means, and a predetermined reference signal, and a pulse width detection means to detect the pulse width of the output of this comparator, in optical information ****** according to claim 11. Therefore, an optical information recording device according to claim 11 is realizable with the configuration of a simple detection means.

[0034] Invention according to claim 17 is set to an optical information recording device according to claim 11. A detection means The comparator which compares the light-receiving signal by the light-receiving means with a predetermined reference signal, and a pulse width detection means to detect the pulse width of the output of this comparator, It has the reference signal modification means made into the signal value reduced at a fixed rate from the output value or this output value of said sampling means as a sampling means to incorporate the light-receiving signal by said light-receiving means to predetermined timing, and said predetermined reference signal. Therefore, even if it changes the quantity of light of bottom product power, and the reflection factor in the tooth space of a record medium, it can control without error, and an optical information recording device according to claim 11 can be realized more to high degree of accuracy.

[0035] Invention according to claim 18 has the record layer which said record medium becomes from the record ingredient in which a record mark is formed by heat mode in claim 9 thru/or an optical information recording device given in any 1 of 17. Therefore, the sensibility of change of the amount of reflected lights is dramatically high, and since it is the record medium which can form a record mark immediately after an exposure, it is applicable suitable for claim 9 thru/or an optical information recording device given in any 1 of 17.

[0036]

[Embodiment of the Invention] The gestalt of operation of the first of this invention is explained based on drawing 1 thru/or drawing 5 . Drawing is an outline block diagram showing the optical information recording device of the gestalt of this operation. First, the semiconductor laser (LD) 1 as the light source is formed. The LD control means 2 as a light source control means which controls that output power while becoming irregular to this semiconductor laser 1 according to record data (predetermined information) prepares, and it is ********. moreover -- this -- semiconductor laser -- one -- outgoing radiation -- carrying out -- having had -- an output -- light -- PL -- a record medium -- three -- a top --

convergent radiotherapy -- carrying out -- an objective lens -- etc. -- containing -- an optical pickup -- (-- PU --) -- four -- preparing -- having -- **** . Furthermore, the light-receiving means 5 containing the photo detector which receives light through PU4 and changes the reflected light Pd from a record medium 3 into a light-receiving signal is established. Moreover, a detection means 6 by which the output power of semiconductor laser 1 detects the formation condition of a record mark by the LD control means 2 from the light-receiving signal RF immediately after changing to the bottom product power (it being usually the same as playback power) in which a record mark is not formed from record power is established. The detecting signal of this detection means 6 is fed back to the LD control means 2 here, the LD control means 2 asks for the gap from the optimal record power in that time of day based on a detecting signal, and the function which controls the output power of semiconductor laser 1 to become the optimal record power is added.

[0037] In addition, although naturally constituted [especially] including a servo means to control to make the optical spot which irradiates a record medium 3 irradiate the location of arbitration as an optical information recording device although not illustrated etc., it is not related to the summary of the gestalt of this operation, and since what is necessary is just to use a common knowledge technique, explanation is also omitted. Next, the control to the optimal record power by the detection means 6 and the LD control means 2 is explained. Drawing 2 is the wave form chart showing a wave of operation. Among drawing, (a) shows the luminescence wave of the output light PL of semiconductor laser 1, and (b) shows the wave of the reflected light Pd from the record medium 3 by the luminescence wave. Pw' is the record power of the output light PL which carried out outgoing radiation from semiconductor laser 1 here, and Pb' is the bottom product power of the output light PL which carried out outgoing radiation from semiconductor laser 1. This bottom product power Pb' is power low enough to extent which does not form a record mark, and is usually made the same as that of playback power.

[0038] Under such a situation, the output light PL which carried out outgoing radiation is irradiated by the record medium 3 through PU4 from semiconductor laser 1. At this time, a record medium 3 is that which is rotating with a certain fixed linear velocity (constant angular velocity method = linear velocity is fixed also in this case in a certain radius location although there may be CAV), and the record mark M as an optical spot will progress with constant speed and indicates the truck top of a record medium 3 to be to drawing 2 (c) at the luminescence section of record power Pw </SUB> ' is formed relatively. And in the luminescence section of bottom product power Pb', the record mark M is not formed but it becomes a tooth space.

[0039] Here, the mimetic diagram of the relation of the record mark M and the optical spot which were formed by time-of-day t=t10 just before changing to drawing 3 (a) to bottom product power Pb' from record power Pw' is shown. When the optimal record power is irradiated to b by the record medium 3 among the edges (back end edge) of the illustrated record mark M, when [than the optimal record power] too little, c shows [a] respectively the case of being more excessive than the optimal record power. Thus, when record power Pw' itself has shifted from the optimal record power, as a factor which shifts from the optimal record power, the case where the light irradiated on a record medium 3 by dispersion in the record sensibility of a record medium 3 etc. by the focal location of an optical spot to the tilt of a record medium 3, gap (defocusing), etc. when the optimal record power is not fixed in a field is distorted, and power effective in record mark formation runs short etc. is mentioned. Moreover, as a factor above-mentioned record power Pw' itself shifts [factor] from the optimal record power, when the set point itself had shifted, luminescence power may have changed with the temperature characteristics of semiconductor laser 1. Therefore, as mentioned above with the conventional technique, even if it controls the output power of semiconductor laser 1 to keep constant the set point of the optimal record power beforehand computed by trial writing, the problem that the record mark M formed will shift from an optimum value as a or c shows occurs.

[0040] Moreover, drawing 3 (b) shows the mimetic diagram of the relation of the record mark M and the optical spot which were formed by time-of-day t=t11 immediately after changing to bottom product power Pb' from record power Pw'. Since the record medium 3 currently assumed with the gestalt of this operation has the property that a reflection factor falls when the record mark M is formed, the amount of

reflected lights in this time of day t11 serves as a value depending on the formed record mark M. That is, it comes to be shown in drawing 4 and this value can detect the formation condition of the record mark M. Moreover, in time-of-day t>t11, since the rate that the record mark M in a spot occupies decreases gradually as an optical spot advances, the amount of reflected lights increases gradually and becomes a certain value (the amount of reflected lights in case the record mark M does not exist in a spot). The formation condition of the record mark M is detectable with time amount until it becomes a certain predetermined value from time-of-day t=t11 which changed to this bottom product power Pb'. Moreover, immediately after changing to record power Pw' (t=t0), since the record mark M is not formed, the amount of reflected lights under record power Pw' exposure (t0 <=t<=t10) still shows change to which the amount of reflected lights decreases as the amount of reflected lights is large and the record mark M is formed gradually. For example, if the case where it records by the optimal record power is taken for an example, the wave of the amount of reflected lights comes to be shown in drawing 2 (b).

[0041] Drawing 5 changes with formation conditions of the record mark M here, as it is the signal waveform diagram changed into the light-receiving signal RF with the light-receiving means 5 and the amount of reflected lights after time of day (t=t11) was mentioned above. a, b, and c show the wave of too little and the light-receiving signal in the case of being the optimal and excessive, as record power Pw' illustrated by drawing 3 respectively. Moreover, bottom product power Pb' supposes that it is fixed. According to drawing 5 , a wave-like change of the light-receiving signal RF after changing to bottom product power Pb' shows that the formation condition of the record mark M is detectable. Therefore, when the optimal record power is computed by carrying out trial writing before a recording start, At the same time it tries and writes and records a pattern, changing record power Pw' If the response relation between record power Pw' and the detection result of the detection means 6 is held, it tries and writes and the optimal record power is called for from the symmetric property over the long mark of the short mark of a regenerative signal etc. the back So that this control-objectives value and the output of the detection means 6 under record may be in agreement by making the detection result of the detection means 6 corresponding to it into a control-objectives value Even when controlling record power Pw' by the LD control means 2 and various kinds of fluctuation is during record, it can always maintain to the optimal record power.

[0042] The gestalt of operation of the second of this invention is explained based on drawing 6 . The same part as the part shown with the gestalt of the first operation is shown using the same sign, and explanation is also omitted (suppose that it is the same also with the gestalt of each following operation). The gestalt of this operation shows the example of a configuration of the detection means 6, and is constituted by the bottom product hold means 10 and the sampling means 11. The bottom product hold means 10 is a circuit which detects and holds the bottom product value (minimal value) of the light-receiving signal by the light-receiving means 5. V1 shown in drawing 5 shows an example of the bottom product value held by the bottom product hold means 10. The sampling means 11 incorporates the output value of this bottom product hold means 10 to the predetermined timing S1, and is constituted by the A/D converter etc.

[0043] Therefore, if the output value of the bottom product hold means 10 is incorporated with the sampling means 11 to the predetermined timing S1, the output value (detecting signal) V1 will correspond to the amount of reflected lights immediately after the output of semiconductor laser 1 changes to bottom product power Pb', and as mentioned above, it will turn into a value by the formation condition of the record mark M. Therefore, what is necessary is just to control record power Pw' by the LD control means 2 to be set to control-objectives value V1b corresponding to the optimal record power computed when this detecting signal V1 was trial writing.

[0044] The gestalt of operation of the third of this invention is explained based on drawing 7 . The gestalt of this operation uses together the APC (Automatic Power Control) function for controlling the output fluctuation by the temperature characteristic of semiconductor laser 1 etc. in the configuration of the gestalt of the second operation of the above-mentioned. An APC function carries out the monitor of a part of outgoing radiation light of semiconductor laser by the photo detector, and is made to emit light

with the output power of a request of semiconductor laser generally by always controlling the forward current of semiconductor laser so that this light-receiving signal and a luminescence command signal become equal. However, in carrying out modulation actuation of the semiconductor laser 1 like the gestalt of this operation etc. at high speed, a high-speed APC circuit is needed and it will become very difficult and expensive to constitute this. But by bottom product power, it holds and a sample / that this controls only bottom product power luminescence can realize the monitor signal at the time of luminescence comparatively easily. So, with the gestalt which is this operation, to the configuration shown in drawing 6 , it is added so that the APC function for bottom product power by the photo detector (PD) 12, the sample hold circuit (S/H) 13, and the APC circuit 14 which are a light-receiving means for monitors may become alternative the LD control means 2 side.

[0045] A photo detector 12 carries out monitor light-receiving of a part of output light of semiconductor laser 1. A sample hold circuit 13 both holds the sampled monitor output for which the monitor output of a photo detector 12 is sampled at the time of the record power Pw' output of semiconductor laser 1 at the time of the bottom product power Pb' output of semiconductor laser 1. The APC circuit 14 controls bottom product power Pb' of semiconductor laser 1 according to the output of a sample hold circuit 13.

[0046] In such a configuration, bottom product power Pb' of semiconductor laser 1 is controlled by the APC circuit 14 according to the monitor output of a photo detector 12 at the time of the bottom product power Pb' output of semiconductor laser 1. Moreover, at the time of the record power Pw' output of semiconductor laser 1, it controls by the light source control means 2 like the gestalt of operation mentioned above. Consequently, since the detecting signal V1 which passed through the sampling means 11 is not influenced by bottom product power Pb' of fluctuation but can detect with a sufficient precision, highly precise record power control is attained.

[0047] Although fluctuation of record power Pw' can also be controlled by controlling bottom product power Pb' of semiconductor laser 1 by the APC circuit 14, and incidentally making it this interlocked with, since the other factors mentioned above as a factor of the gap from the optimal record power also influence greatly, it is not appropriate when solving the technical problem of this invention.

[0048] The gestalt of operation of the fourth of this invention is explained based on drawing 8 . The gestalt of this operation shows other examples of a configuration of the detection means 6, and is constituted by the divider 16 as the bottom product hold means 10, the sampling means (1st sampling means) 11, the sampling means (2nd sampling means) 15, and a normalization means. The bottom product hold means 10 and the sampling means 11 are the same as that of the case where it mentions above. The sampling means 15 incorporates the output value of the bottom product hold means 10 to the 2nd predetermined timing S2, and is constituted by the A/D converter etc. The predetermined timing S2 is after the time of day (it asks from the diameter of an optical spot, and record linear velocity) when the optical spot stopped lapping with the record mark M, and is the timing before change to following record power Pw'. The value sampled by this sampling means 15 is V2 shown in drawing 5 , if the bottom product power quantity of light and the reflection factor in the tooth space of a record medium 3 are changed, these V2 will be interlocked with and V1 will be changed. Therefore, the detecting signal which normalized by carrying out the operation which becomesV1/V2 of dividers by 16 is outputted to the LD control means 2. If this controls the record power of semiconductor laser 1 by the LD control means 2 by making value V1 b/V2b in the optimal record power into desired value, even if it changes the bottom product power quantity of light and the reflection factor in the tooth space of a record medium 3, it is controllable without error.

[0049] In addition, the sampling means 11 and 15 may be made to communalize, when the gestalt of this operation is constituted. Moreover, what is necessary is spacing of a tooth space being short, and making it just make it sample only at the time of a tooth space longer than S2, when the sample timing's S's2 cannot be taken.

[0050] The gestalt of operation of the fifth of this invention is explained based on drawing 9 . The gestalt of this operation shows the example of a configuration of further others of the detection means 6, and is constituted by the comparator 17 and the pulse width detection means 18. A comparator 17 compares the size of the light-receiving signal by the light-receiving means 5, and the predetermined

reference signal Vr (threshold). The pulse width detection means 18 detects the pulse width of the output of this comparator 17.

[0051] In drawing 5 , if time amount which the light-receiving signal RF becomes from V2 or V2 below the threshold Vr by making a value low a little into a threshold Vr as compared with the light-receiving signal RF is set to T2, as shown also in drawing, T2 will become a value depending on the formation condition of the record mark M. That is, when [than the optimal record power] too little, T2 becomes smaller than proper value T2b, and when excessive, T2 becomes larger than proper value T2b. If it thinks with the configuration of drawing 9 , a comparator 17 will compare the light-receiving signal RF and a threshold Vr, and the size will be made binary. This output pulse is set to T2. The pulse width detection means 18 detects this pulse width T2, and makes this output a detecting signal VT 2. It is, if record power is controlled to become detection value VT2b in the optimal record power computed when this detecting signal VT 2 was trial writing, and it is **. Since a gap of the optimal record power does not change rapidly, the pulse width detection means 18 can be easily constituted by graduating the output of a comparator 17 with a low pass filter etc., and changing pulse width into an electrical potential difference etc. Of course, a comparator 17 may be remaining as it is or a thing which amplifies, outputs, graduates this and is changed into an electrical potential difference about a part for the error of the not only a thing but the light-receiving signal RF and threshold Vr which output the pulse made binary.

[0052] In addition, in the gestalt of this operation, if a threshold Vr is changed according to V2 which changes with fluctuation of the bottom product power quantity of light and the reflection factor in the tooth space of a record medium 3 etc., even if it changes the bottom product power quantity of light, the reflection factor in the tooth space of a record medium 3, etc., it is controllable [a threshold Vr is not considered as immobilization, but] without error. In this case, V2 is detectable with the sampling means 15 under configuration shown in drawing 8 . What is necessary is making it just make it input into a comparator 17, using the value which carried out the level shift of the value (or average V2' of some last values) of Vdetected 2 at a rate remaining as it is or fixed with the reference signal generation means 19 as shown in drawing 9 (b) as new threshold Vr'.

[0053] Moreover, although not illustrated especially, if the bottom product value V1 and time amount T2 of the light-receiving signal RF which were shown in drawing 5 are detected respectively and record power is controlled based on these two detection values, it can control with a more sufficient precision. Namely, while detecting the light-receiving signal (bottom product value V1) in near immediately after immediately after receiving the reflected light from a record medium 3 with the light-receiving means 5, changing into a light-receiving signal, and controlling the output power of semiconductor laser 1 to bottom product power The time amount T2 until a light-receiving signal becomes a predetermined value from the time of day controlled to bottom product power is detected, and the output power of semiconductor laser 1 is controlled by the LD control means 2 according to these detection results. A detection means for this can use an example as shown in the gestalt of the above-mentioned operation.

[0054] The gestalt of operation of the sixth of this invention is explained with reference to drawing 10 . The gestalt of this operation is an example of application in case the modulation approach of the semiconductor laser 1 by the LD control means 2 is the multi-pulse record approach which forms one record mark by two or more pulse trains. That is, when making semiconductor laser 1 emit light according to the multi-pulse record approach as shown in drawing 10 (a) and forming the record mark M in a record medium 3, the wave of the reflected light from a record medium 3 comes to be shown in drawing 10 (b). In this case, it is very difficult like before to detect the formation condition of a record mark from change of the amount of reflected lights during record mark formation (section of t0 <=t<=t10). however, the reflected light wave immediately after record mark formation (time-of-day t=t11 or subsequent ones) -- (-- a round head is attached and shown in drawing 10 (b) -- it is decided only by the record mark concerned and formed in differences of a record wave, such as), single pulse record, or multi-pulse record. That is, since the reflected light wave immediately after record mark formation (time-of-day t=t11 or subsequent ones) becomes being the same as that of the case of the single pulse record shown in drawing 2 , it turns out that the formation condition of a record mark can be

detected like the case of the gestalt of each operation mentioned above. And what is necessary is just to control record power to become the control-objectives value computed when the detecting signal was trial writing. Moreover, what is necessary is to perform the bottom product hold of a light-receiving signal like the case where it is shown in drawing 7 etc., and just to sample the value, since the value as the case of time-of-day t=t11 also with the almost same amount of reflected lights immediately after once dropping the output power of semiconductor laser 1 during record mark formation like time of day t2, t3, and t4 at bottom product power is taken.

[0055] The gestalt of operation of the seventh of this invention is explained with reference to drawing 11 . The gestalt of this operation shows the example of application to the case where it has the record layer which a record medium 3 becomes from the record ingredient in which a record mark is formed by heat mode. The record layer of a record medium 3 produces the optical change by the substrate deformation accompanying the pyrolysis and it by laser beam exposure, and is recorded by forming the record mark M by the change. When recording on the record medium 3 in which a record mark M is formed by such heat mode, change of the amount of reflected lights under record has dramatically high sensibility, that is, since it is detectable in the formation condition of a record mark M also immediately after dropping laser power to the power (bottom product power) which does not produce optical change since the field (a record mark) where reflection factors differed immediately after irradiating a laser beam is formed, the gestalt of each operation which mentioned above can apply suitably.

[0056] By the way, typically as a record intermediation ingredient in which a record mark is formed by such heat mode, organic coloring matter is used. As the example, poly methine coloring matter, a naphthalocyanine system, a phthalocyanine system, a squarylium system, a crocodile NIUMU system, a pyrylium system, a naphthoquinone system, an anthraquinone system (indanthrene system), a xanthene system, a triphenylmethane color system, an azulene system, a tetrahydro choline system, a phenanthrene system, a TORIFENO thiazin system color, a metal complex compound, etc. are mentioned. It is made to mix or laminate with other organic coloring matter and a metal, and metallic compounds, and you may make it use these coloring matter for the object of improvement, such as an optical property, record sensibility, and a signal property. Moreover, as an example of a metal and metallic compounds, In, Te, Bi, Se, Sb, germanium, Sn, aluminum, Be, TeO2, SnO, As, Cd, etc. are mentioned, and each can be used with distribution, mixing, or the gestalt that carries out a laminating. What is necessary is just to use the usual approaches, such as vacuum evaporationo, sputtering, CVD, or solvent spreading, as the formation approach of a record layer. What is necessary is to dissolve the color mentioned above in an organic solvent, and just to carry out with coating methods used commonly, such as a spray, roller coating, tipping, and a spin coating method, in using the applying method.

[0057] Moreover, the reaction rate of the optical change accompanying the mark formation at the time of record will change with the class of record ingredient mentioned above, thickness of a record layer, etc. That is, also after the output of semiconductor laser 1 changes from record power to bottom product power, a record mark will be formed, and some difference comes to show the light-receiving signal RF of a certain thing in general to drawing 11 with the relation between the rate of optical change, and linear velocity. Even in this case, since the amount of detection changes with formation conditions of a record mark like the case where it is shown in drawing 5 , the gestalt of each operation mentioned above is applicable similarly.

[0058] In addition, in other record ingredients with which mark formation is made by heat mode, in order that change of the amount of reflected lights under record may show the same inclination fundamentally, the thing with effective this invention to say cannot be overemphasized.

[0059]

[Effect of the Invention] By detecting change of the light-receiving signal within a certain predetermined section, or a light-receiving signal from from immediately after controlling the output power of the light source to the bottom product power in which a record mark is not formed according to invention according to claim 1 By being able to detect the formation condition of a record mark and controlling the output power of the light source according to this detection result during record Are recordable, always controlling to the optimal record power in the condition, even if fluctuation of the optimal record

power by a tilt, sensibility dispersion, etc. of output fluctuation of the light source or a record medium arises. Moreover, or change of the amount of reflected lights from the record medium by record mark formation hardly appears during a record power exposure, it is buried in the variable component of record power, and it is recordable, controlling to the optimal record power, even if the detection is a difficult record medium and record conditions.

[0060] Since according to invention according to claim 2 the light-receiving signal in near immediately after is detected and the output power of the light source was controlled according to this detection result immediately after controlling the output light of the light source to bottom product power, the effectiveness same simple as the case where it can detect to accuracy and is invention according to claim 1 can be acquired for the formation condition of a record mark.

[0061] Since according to invention according to claim 3 time amount until a light-receiving signal becomes a predetermined value from the time of day which controlled the output power of the light source to bottom product power is detected and the output power of the light source was controlled according to this detection result Even if it is a case with it difficult [to be able to acquire the same effectiveness as the case of invention according to claim 1, to carry out change with the steep optical output of the light source, therefore to detect a light-receiving signal to a high speed and accuracy], easy and the formation condition of the record mark to accuracy are detectable.

[0062] While detecting the light-receiving signal in near immediately after immediately after controlling the output power of the light source to bottom product power according to invention according to claim 4 Since time amount until a light-receiving signal becomes a predetermined value from the time of day controlled to bottom product power is detected and the output power of the light source was controlled according to these detection results, the same effectiveness as the case of invention according to claim 1 can be acquired with a more sufficient precision.

[0063] According to invention according to claim 5, when realizing claim 1 thru/or the optical information record approach given in any 1 of 4, the output power of the light source is easily controllable.

[0064] According to invention according to claim 6, at the time of detection of the formation condition of a record mark, since the output power of the light source is not changed, it can perform exact detection, i.e., control of exact record power.

[0065] According to invention according to claim 7, also in the case of mass recording methods, such as DVD, claim 1 thru/or the optical information record approach given in any 1 of 6 are applicable convenient.

[0066] According to invention according to claim 8, the sensibility of change of the amount of reflected lights is dramatically high, and since it is the record medium which can form a record mark immediately after an exposure, it is applicable suitable for claim 1 thru/or the optical information record approach given in any 1 of 7.

[0067] By establishing a detection means to detect change of the light-receiving signal within a certain predetermined section, or a light-receiving signal from from, immediately after controlling the output power of the light source to the bottom product power in which a record mark is not formed according to invention according to claim 9 By establishing during record the light source control means which can detect the formation condition of a record mark and controls the output power of the light source according to this detection result Are recordable, always controlling to the optimal record power in the condition, even if fluctuation of the optimal record power by a tilt, sensibility dispersion, etc. of output fluctuation of the light source or a record medium arises. Further Or change of the amount of reflected lights from the record medium by record mark formation hardly appears during a record power exposure, it is buried in the variable component of record power, and it is recordable, controlling to the optimal record power, even if the detection is a difficult record medium and record conditions.

[0068] According to invention according to claim 10, the effectiveness same simple as the case where it can detect to accuracy and is invention according to claim 9 can be acquired for the formation condition of a record mark by establishing a detection means to detect the light-receiving signal in near immediately after, immediately after controlling the output light of the light source to bottom product

power, and establishing the light source control means which controls the output power of the light source according to this detection result.
[0069] According to invention according to claim 11, a detection means to detect time amount until a light-receiving signal becomes a predetermined value from the time of day which controlled the output power of the light source to bottom product power is established. By establishing the light source control means which controls the output power of the light source according to this detection result Even if it is a case with it difficult [to be able to acquire the same effectiveness as the case of invention according to claim 9, to carry out change with the steep optical output of the light source, therefore to detect a light-receiving signal to a high speed and accuracy], easy and the formation condition of the record mark to accuracy are detectable with a detection means.
[0070] The 1st detection means which detects the light-receiving signal in near immediately after immediately after controlling the output power of the light source to bottom product power according to invention according to claim 12, By establishing the 2nd detection means which detects time amount until a light-receiving signal becomes a predetermined value from the time of day controlled to bottom product power, and establishing the light source control means which controls the output power of the light source according to these detection results The same effectiveness as the case of invention according to claim 9 can be acquired with a more sufficient precision.
[0071] According to invention according to claim 13, when realizing claim 9 thru/or an optical information recording device given in any 1 of 12, the output power of the light source is easily controllable by having an APC circuit and a light source control means.
[0072] According to invention according to claim 14, an optical information recording device according to claim 10 is realizable with the configuration of a simple detection means.
[0073] According to invention according to claim 15, even if it changes the quantity of light of bottom product power, and the reflection factor in the tooth space of a record medium, it can control without error, and an optical information recording device according to claim 10 can be realized more to high degree of accuracy.
[0074] According to invention according to claim 16, an optical information recording device according to claim 11 is realizable with the configuration of a simple detection means.
[0075] invention according to claim 17 -- getting twisted -- even if it changes the quantity of light of bottom product power, and the reflection factor in the tooth space of a record medium, it can control without error, and an optical information recording device according to claim 11 can be realized more to high degree of accuracy.
[0076] According to invention according to claim 18, the sensibility of change of the amount of reflected lights is dramatically high, and since it is the record medium which can form a record mark immediately after an exposure, it is applicable suitable for claim 9 thru/or an optical information recording device given in any 1 of 17.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline block diagram of the optical information recording device in which the gestalt of operation of the first of this invention is shown.
[Drawing 2] It is the wave form chart showing a wave of operation.
[Drawing 3] It is the mimetic diagram showing the relation between the record mark of in front of change to bottom product power, and an immediately after, and an optical spot.
[Drawing 4] It is the amount property drawing of record power-reflected lights.
[Drawing 5] It is the signal waveform diagram of the light-receiving signal RF.
[Drawing 6] It is the block diagram showing the gestalt of operation of the second of this invention.
[Drawing 7] It is the block diagram showing the gestalt of operation of the third of this invention.
[Drawing 8] It is the block diagram showing the gestalt of operation of the fourth of this invention.
[Drawing 9] It is the block diagram showing the gestalt of operation of the fifth of this invention.
[Drawing 10] It is multi-pulse-shape drawing showing the gestalt of operation of the sixth of this invention.
[Drawing 11] It is the signal waveform diagram of the light-receiving signal RF showing the gestalt of operation of the seventh of this invention.
[Description of Notations]
1 Light Source
2 Light Source Control Means
3 Record Medium
5 Light-receiving Means
6 Detection Means
10 Bottom Product Hold Means
11 Sampling Means, 1st Sampling Means
12 Light-receiving Means for Monitors
13 Sample Hold Circuit
14 APC Circuit
15 2nd Sampling Means
16 Normalization Means
17 Comparator
18 Pulse Width Detection Means
19 Reference Signal Generation Means

[Translation done.]

* NOTICES *

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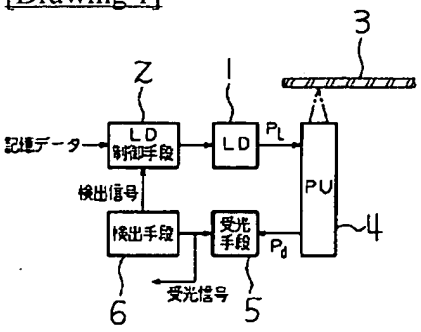
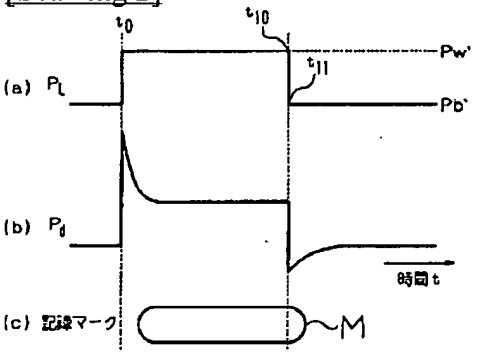
DRAWINGS

[Drawing 1]



[Drawing 2]



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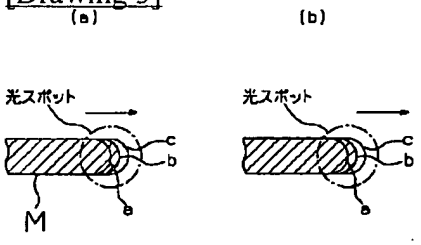

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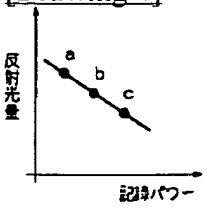

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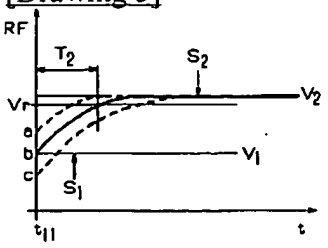

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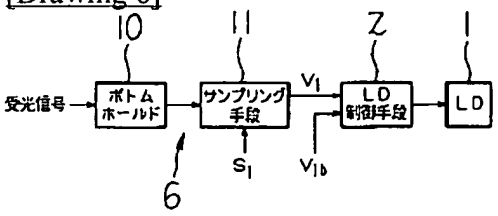
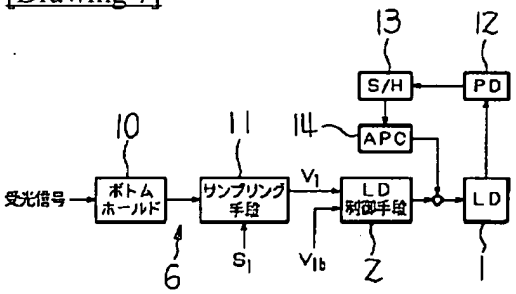


[Drawing 7]



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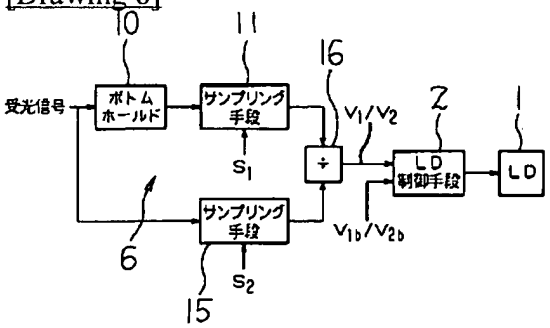

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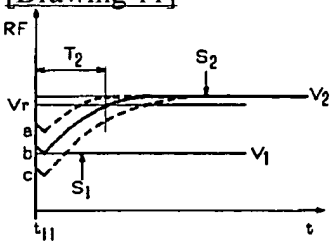
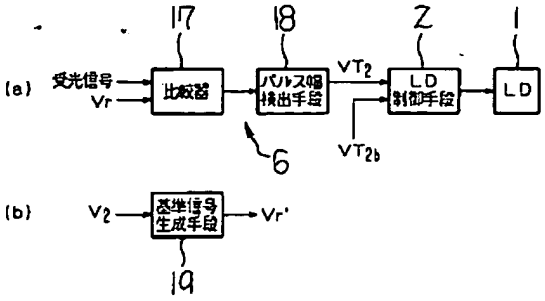
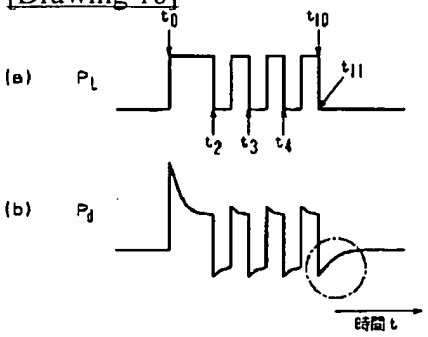


[Drawing 9]



[Drawing 10]



[Translation done.]